PB87-111944

Pesticide Fact Sheet Number 8: Dicamba

(U.S.) Environmental Protection Agency
Washington, DC

17 Oct 83

U.S. Department of Commerce
National Technical Information Service
NTIS

50272-101

REPORT DOCUMENTATION PAGE	1. REPORT NO.	2.	PB87-111944

4. Title and Subtitle EPA Pesticide Fact Sheets - DICAMBA No. 8	5. Report Date Issued 10/17/83 6.
7. Author(s) EPA, Office of Pesticide Programs, Registration Division	8. Performing Organization Rept. No. 540/FS-87- 049
9. Performing Organization Name and Address US Environmental Protection Agency Office of Pesticide Programs Registration Division, TS-767C 401 M Street, S.W. Washington, D.C. 20460	10. Project/Task/Work Unit No. 11. Contract(C) or Grant(G) No. (C) (G)
12. Sponsoring Organization Name and Address Same as #9	13. Type of Report & Period Covered 14.

15. Supplementary Notes

16. Abstract (Limit: 200 words)

This document contains up-to-date chemical information, including a summary of the Agency's regulatory position and rationale, on a specific pesticide or group of pesticides. A Fact Sheet is issued after one of the following actions has occurred.

1. Issuance or reissuance of a registration standard,
2. Issuance of each special review document,
3. Registration of a significantly changed use pattern,
4. Registration of a new chemical, or
5. An immediate need for information to resolve controversial issues relating to a specific chemical or use pattern.

17. Document Analysis a. Descriptors

Pesticides, regulations, Chemical Information Fact Sheet, Use Patterns, Science Findings

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement: Publicly Available	19. Security Class (This Report) Unclassified	21. No. of Pages 6
	20. Security Class (This Page) Unclassified	22. Price $9.95

(See ANSI-Z39.18)

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U.S. DEPARTMENT OF COMMERCE
NATIONAL TECHNICAL
INFORMATION SERVICE
SPRINGFIELD, VA 22161

OPTIONAL FORM 272 (4-77)
(Formerly NTIS-35)
Department of Commerce

United States
Environmental Protection
Agency

Office of Pesticides and Toxic Substances
Office of Pesticide Programs (TS-766C)
Washington, DC 20460

EPA

Pesticide Fact Sheet

Name of Chemical: DICAMBA
Reason for Issuance:
Date Issued: Oct. 17, 1983
Fact Sheet Number: 8

1. Description of Chemical:

Generic name: 3,6-dichloro-o-anisic acid
Common name: Dicamba
Trade Names: Banvel, Banex, Brush Buster, Mediben, Velsicol 58-CS-11
EPA Shaugnnessy Number: 029802
Chemical Abstracts Service (CAS) Number: 1918-00-9
Year of initial registration: 1967
Pesticide type: Herbicide
Chemical family: Benzoic acid
U.S. and foreign producers: Velsicol Chemical Corporation

2. Use Patterns and Formulations:

Application sites: corn, small grains, grain sorghum, asparagus, sugarcane, pastures, rangeland and agricultural seed crops, noncrop sites, forest lands, lawns and ornamental turf

Types of formulations: diethanolamine, monoethanolamine, dimethylamine and sodium salts as soluble concentrates or granulars.

Types and methods of application: Applied by aerial or ground spray, invert system, tree injection or granular equipment. Dicamba is applied preplant, preemergence or postemergence.

Application rates:

1/4 pound active per acre to grain sorghum
1/8-1/2 pound active per acre to small grains, asparagus
1/4-3 pounds active per acre to sugarcane
1/2-8 pounds active per acre to pasture, range and noncropland
1/4-1 pound active per acre to turf and grass seed crops

Usual carriers: water, fluid and dry fertilizer, oil in water emulsions, clay or vermiculite

3. Science Findings:

Summary Science Statement:

Dicamba appears to pose little acute toxicity or environmental hazard. The major problem appears to be the potential for a dimethylnitrosamine (DMNA) contaminant in the dimethylamine formulations. The level of DMNA is expected to be below 1 ppm and the risk level for dicamba with DMNA is 10^{-7} to 10^{-8} range.

Chemical Characteristics:

It is a light tan slightly phenolic crystalline solid. It is stable to oxidation and hydrolysis and melts at temperatures between 90-100°C. Dicamba is nonflammable and does not present any unusual handling hazards.

Toxicology Characteristics:

Acute Toxicology Results:

Oral LD_{50} in rats: 2.74 mg/kg body weight, Toxicity Category III

Dermal LD_{50} in rats >2,000 mg/kg, Toxicity Category IV

Inhalation LC_{50} in rats: >200 mg/l, Toxicity Category IV

Eye irritation in rabbits: Induced corrosiveness of conjunctival tissues and corneal injury which was reversible in 72 hours. In a recent study eye damage was irreversible and pannus was observed. Toxicity Category I.

Dermal Irritation: slight dermal irritation.

Chronic Toxicology Results:

Teratology in rabbits: NOEL of 3.0 mg/kg/day for maternal toxicity; not teratogenic.

Teratology in rats: Teratology NOEL = 400 mg/kg; maternal toxicity NOEL = 160 mg/kg

Three-generation reproduction study in rats: No evidence of toxicity among the rats from any of the generations in the study. No test article related effects were evident for any reproductive indices examined. NOEL of 25 mg/kg/day.

90-day subchronic feeding study with rats: The NOEL is 250 mg/kg/day. LEL was 500 mg/kg/day (slight decrease in comparative body weight gains and food consumption and evidence of reduced glycogen storage).

Major Routes of Exposure:

Dermal and inhalation exposure to humans may occur during application, particularly via splashing during dilution, mixing and loading. Application by aircraft increases the potential for exposure of humans, livestock, and wildlife due to spray drift and ventilation.

Risk Assessment and Contaminants:

The manufacturing process for dicamba has potential of resulting in traces of 2,7-dichlorodibenzo-p-dioxin as a contaminant. It is present at levels up to 50 ppb (parts per billion). The more toxic dioxin isomer, 2,3,7,8-tetrachlorodibenzo-p-dioxin, has not been found at the limit of detection (2 ppb) of the method and is not expected as an impurity in dicamba.

Dicamba products formulated with the dimethylamine salt have the potential of adding a dimethylnitrosamine (DMNA) contaminant. Nitrosamine levels in the dimethylamine formulations are expected to be less than 1 ppm. The risk levels for the dicamba products with the nitrosamine contaminant are in the 1×10^{-7} to 1×10^{-8} range.

The benefits outweigh the risks associated with the nitrosamines. The performance of the dicamba-containing herbicides is such that they are viable alternatives to the suspended uses (home lawns, pastures, ditchbanks and forests) of silvex and 2,4,5-T.

Physiological and Biochemical Behavioral Characteristics:

Foliar absorption: Readily absorbed by leaves.

Translocation: Dicamba is absorbed by leaves and is readily moved to other plant parts.

Mechanism of pesticidal actions: Exhibits properties of an auxin-like plant growth regulator.

Plant metabolism: Rapidly absorbed and metabolized almost entirely into soluble metabolites and insoluble plant products (celluloses).

Animal metabolism: Some dicamba is demethylated to the metabolite, 3,6-dichloro-2hydroxybenzoic acid. Most dicamba is excreted rapidly in urine as the free and/or conjugated form.

Environmental Characteristics:

Adsorption and leaching in basic soil types:

Dicamba (free acid and dimethylamine salt) is adsorbed to peat, but not appreciably adsorbed to soils ranging from heavy clay to loamy sand.

Dicamba is readily mobile in soils ranging from clay to loamy sand.

Microbial breakdown:

Under aerobic conditions in soil dicamba degrades with half-lives ranging from 1 to 6 weeks depending on soil texture. Degradation rates are slowed by decreasing temperatures (<20°C) and decreasing soil moisture below field capacity.

Loss from Photodecomposition and/or volatilization:

Phytotoxic dicamba (free acid) residues are photodegraded in water to nonphytotoxic levels.

Dicamba is volatile with losses of 60% in glass flow tubes and 49% from thin films. Data from sterile and nonsterile soil samples indicate that larger losses of dicamba are due to metabolism rather than to volatilization.

Resultant average soil persistence:

Dicamba has a half-life of 1 to 6 weeks. It may be leached out of the zone of activity in humid regions in 3 to 12 weeks. Dicamba may persist longer under conditions of low soil moisture and rainfall.

Ecological Characteristics:

Avian oral LD_{50} >2,510 mg/kg (practically non-toxic)
Avian dietary LC_{50} > 10,000 ppm (practically non-toxic)
Aquatic invetebrates LC_{50} >100 mg/l (practically non-toxic)
Cold water fish LC_{50} = 135.3 mg/l (slightly toxicity)
Warm water fish LC_{50} >1,000 mg/l (practically non-toxic)

Available data indicate that dicamba is practically non-toxic to fish and wildlife and unlikely to directly affect these organisms. Use patterns of the chemical do not present any problem to endangered species.

Tolerance Assessments:

Crops and tolerances:

0.1 ppm on sugarcane, sugarcane fodder and sugarcane forage.

0.2 ppm on meat, fat and meat byproducts (except liver and kidney) of cattle, goats, hogs, horses and sheep

0.3 ppm on milk

0.5 ppm on barley grain and barley straw; corn fodder, forage, and grain; oat grain and oat straw, and wheat grain and wheat straw.

1.5 on kidney and liver of cattle, goats, hogs, horses and sheep.
2.0 ppm on sugarcane molasses (food/feed additive tolerance)

3.0 ppm on asparagus, sorghum fodder, forage and grain

40.0 ppm on grasses, hay; grasses, pasture; grasses, rangeland.

Results of tolerance assessment:

The available residue data support the existing tolerances.

Tolerances on sorghum milling fractions, poultry and eggs may be required once requested residue data and poultry feeding are submitted.

Based on a NOEL of 600 ppm (rat subchronic study) and a 2,000-fold safety factor, the existing tolerance utilizes 37.58% of the PADI.

Problems which are known to have occurred with the use of the chemical:

Based on the Pesticide Incident Monitoring System (PIM's) report, most reported incidents with dicamba involve phytotoxicity to adjoining crops because of drift.

4. Summary of Regulatory Position and Rationale:

Use Classification: General Use

Summary of risk/benefit review:

The risk level for dicamba products containing DMNA is in the 10^{-7} to 10^{-8} range. The Agency considers that the benefits outweigh the risk associated with the nitrosamines. The product performance of dicamba-containing herbicides is such that they are viable alternatives of several of the suspended uses of silvex and 2,4,5-T, such as for home lawns, pastures, along ditchbanks and brush control in pastures.

Use Restrictions:

Dicamba may not be used in any way which contaminates irrigation ditches or water for domestic purposes.

Unique label warning statement:

Crops for which dicamba is not registered may not be planted in dicamba-treated fields.

5. Summary of Data Gaps and Dates When These Gaps Are to be Filled:

Residue data on poultry, eggs, and sorghum	October 1987
Milling fractions	October 1987
Poultry feeding study	October 1987
Hydrolysis	October 1987
Photodegradation	October 1987
Laboratory metabolism studies	October 1987
Mobility	October 1987
Field dissipation studies	October 1987
Accumulation studies	October 1987
90-day feeding (Nonrodent)	October 1987
Chronic feeding/oncogenicity (2 species)	October 1987
Mutagenicity test	October 1987

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